CLAIMS (90)

1. A method of treating titania slag to increase the leachability of impurities from the slag comprising the steps of

- sizing the titania slag to a particle size from 75 to 850 μm;
- oxidising the sized slag particles in an oxidising atmosphere at a temperature from about 700°C and above but below about 950°C for at least 30 minutes allowing an anatase phase to stabilise in the slag, allowing the iron present in the slag to concentrate at the exposed surfaces of the slag particles, allowing a major portion of the iron in the Fe(II) state to convert to the Fe(III) state, and allowing the titanium in the Ti(III) state to be converted to the Ti(IV) state; and
- reducing the oxidised slag in a reducing atmosphere from about 700°C to about 950°C for at least 5 minutes to convert a major portion of the iron in the Fe(III) state to the Fe(II) state and without converting a substantial portion of the titanium in the Ti(IV) state to the Ti(III) state.

2. The method of claim 1 wherein the oxidation is carried out at a temperature from about 750°C and above but below about 900°C.

3. The method of claim 2 wherein the oxidation is carried out at a temperature from about 800°C to about 875°C.

4. The method of any one of the preceding claims wherein more than 90% of the iron in the Fe(II) state is converted to the Fe(III) state during oxidising of the slag.

5. The method of any one of the preceding claims wherein substantially all the iron in the Fe(II) state is converted to the Fe(III) state during oxidising of the slag.

6. A method of beneficiating titania slag to increase the TiO_2 content thereof to at least 90% by weight comprising the steps of:

- sizing the titania slag to a particle size from 75 to 850 μm;
- oxidising the sized slag particles in an oxidising atmosphere at a temperature from about 700°C and above but below about 950°C for at least 30 minutes allowing an anatase phase to stabilise in the slag, allowing the iron present in the slag to concentrate at the exposed surfaces of the slag particles, allowing a major portion of the iron in the Fe(II) state to convert to the Fe(III) state, and allowing the titanium in the Ti(III) state to be converted to the Ti(IV) state;
- reducing the oxidised slag in a reducing atmosphere from about 700°C to about 950°C for at least 5 minutes to convert a major portion of the iron in the Fe(III) state to the Fe(II) state and without converting a substantial portion of the titanium in the Ti(IV) state to the Ti(III) state; and
- leaching the reduced slag with acid to obtain a beneficiated slag product with an increased TiO_2 content and leach liquor containing the leached impurities.

7. The method of claim 6 wherein the leaching is conducted under pressure in excess of atmospheric pressure.

8. The method of claim 6 wherein the leaching is conducted at atmospheric pressure.

9. The method of claim 6 wherein the acid used in the leaching step is heated.

10. The method of claim 6 wherein the acid used in the leaching step comprises hydrochloric acid.

11. The method of claim 6 which includes a caustic leaching step after the acid leaching step.

12. The method of claim 6 which includes a step of calcining the treated slag.

13. The method of claim 12 wherein the treated slag is washed and dried to remove volatile by products prior to the calcining step.

14. The method of either one of claims 12 or 13 wherein the calcined slag is subjected to a magnetic separation procedure.

15. The method of any one of claims 6 to 14 wherein the oxidation is carried out at a temperature from about 750°C and above but below about 900°C.

16. The method of claim 15 wherein the oxidation is carried out at a temperature from about 800°C to about 875°C.

17. The method of any one of claims 6 to 16 wherein more than 90% of the iron in the Fe(II) state is converted to the Fe(III) state during oxidising of the slag.

18. The method of any one of claims 6 to 17 wherein substantially all the iron in the Fe(II) state is converted to the Fe(III) state during oxidising of the slag.

19. A product when formed by a method of any one of the preceding claims.